MORRISON HERSHFIELD

March 22, 2011

Ted Cullen
TBC (Canada) Inc.
45016 Rochon Rd.
P.O. Box 577, La Salle, Manitoba
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Dear Mr. Cullen:

Re: Use of Effective R-values for Evaluation of Insulated Assemblies

We have been asked to provide comments regarding the use of effective R-values when determining the insulation value of specific assemblies, as well as a discussion of the differences between nominal (or labeled) and effective R-values.

Terminology

Nominal R-values describe the thermal resistance of a particular insulating material, and are not necessarily indicative of the R-value of the full assembly in which this material will be placed. The listed thermal resistance applies only to the material itself.

Effective R-values describe the thermal resistance of a particular assembly with the installed insulation. For example, placing nominal R-20 batt insulation in a wood framed wall 5.5" in depth will yield a higher effective R-value than placing the same nominal R-20 batt insulation in a similarly dimensioned metal stud framed wall, because of thermal bridging at the metal studs.

Discussion

ASHRAE 90.1, Table A3.1D (as an example) lists "*Effective R-values for Insulation/Framing Layers Added to Above-Grade Mass Walls and Below-Grade Walls*". Values are presented for insulation with nominal R-values from 0 to 25, installed in the cavities of wood and metal framed walls of varying depths. For the example listed above (nominal R-20), the effective R-value for the wood framed wall is listed as R-15.8, compared to R-7.1 for the metal framed wall.

Effective R-values are most accurately determined through physical testing at a certified laboratory, using a procedure such as ASTM C1363. Architectural Testing Inc. (ATI) of St. Paul Minnesota is well recognized in Canada and is a certified laboratory to carry out thermal testing including ASTM C1363. Results obtained by this method are highly reliable, and it can be reasonably expected that the in-situ performance of a particular assembly will match the effective R-value it was measured to provide during testing.

Computer programs such as HOT2000 make use of a library of known components to calculate the effective R-values of some walls. It should be noted that these programs are calibrated using results of physical testing, such as those obtained through ASTM C1363, and therefore effective R-values found through either of these methods should be comparable with one another. For complicated analyses, such as three-dimensional simulations of complicated

assemblies, much more complex computer programs are required and there is inherently more potential for errors.

It should also be noted that many provincial building codes, and the National Building Code of Canada, now mandate compliance with ASHRAE 90.1. Provinces whose building codes do not currently require compliance with this standard are expected to change their performance requirements to reflect its criteria in future updates.

Conclusions

The use of effective R-values when evaluating the thermal resistance of an assembly is preferable to using the nominal R-value of the insulation alone. The benefits of this approach have been demonstrated in results obtained through laboratory tests such as ASTM C1363 and by data published in ASHRAE 90.1.

Additionally, we note that results such as those listed in ASHRAE 90.1, Table A3.1D are based on laboratory testing of framed assemblies, and therefore a comparison between these values and those obtained by testing according to the requirements of ASTM C1363 is reasonable.

Yours truly,
Morrison Hershfield Limited

Mark Lawton, P.Eng
Senior Building Science Specialist

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